

U.S. Patent Application Serial No. 10/814,679
Amendment A
Inventors: Roy L. Hood and Gary L. Noedel
Our Reference No. 713629.417

Amendment to the Specification:

Please replace the third full paragraph on Page 1, Lines 10-24, with the following amended paragraph:

~~Doleman et al. disclosed in US Patent 3,507,010 apparatus~~ Doleman et al., disclosed in US Patent No. 3,507,010, an apparatus and methods for making continuous, three-dimensional, molded, polymeric articles having blade-like elements projecting from one surface of a planar ribbed base. Such articles have been produced for a variety of applications, ~~e. g. door mats, e.g., door mats,~~ flooring surfaces, rain flaps and poultry nest pads. One limitation of the Doleman apparatus is that the projecting elements of the articles are made from a single polymeric material. ~~An object of this invention is to produce articles with multi-polymer projecting elements. Surprisingly, it has been discovered that this can be achieved by the apparatus of this invention by first forming the base section of the projecting element and then injecting a different polymer to form the terminal portion of the projecting element through the base section. Another object of this invention is to provide multi-color mats where terminal portions of blade-like elements are of a different color than the base section of the blade-like elements and/or the base of the mat. These and other objects and advantages in molded articles and molding apparatus will be apparent from the following description of this invention.~~

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Please replace the fourth paragraph on Page 1, Lines 27-30, that extends to Page 2, Lines 1-2 with the following amended paragraph:

This invention provides three-dimensional, unitary, molded, multi-polymer articles comprising a generally planar two-dimensional base section and a plurality of projecting elements extending from one side of the base section, where at least some of the projecting elements are multi-polymer elements. A preferred embodiment of the article comprises a mat with multi-color blade-like projecting elements. An aspect of this invention is to produce articles with multi-polymer projecting elements. Surprisingly, it has been discovered that this can be achieved by the apparatus of this invention by first forming the lower portion of the projecting element and then injecting a different polymer through the aforementioned lower portion to form the terminal portion of the projecting element. Another aspect of this invention is to provide multi-color mats where terminal portions of blade-like elements are of a different color than the lower portion of the blade-like elements and/or the base of the mat. These and other aspects and advantages in molded articles and molding apparatus will be apparent from the following description of this invention.

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Please replace the third full paragraph on Page 2, Lines 26-28, with the following amended paragraph:

Figure 1 illustrates a specific embodiment of the multi-color mat according to this invention wherein projecting elements contain a different colored pigment than ~~the base section~~.
the base.

Please replace the fourth paragraph on Page 2, Lines 29-30, that extends to Page 3, Lines 1-2, with the following amended paragraph:

Figure 2 illustrates another specific embodiment of the multi-color mat according to this invention wherein a portion of projecting elements contain the same pigment as ~~the base section~~
the base and a portion of the projecting elements contain a different color pigment from ~~the base section~~ the base.

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Please replace the first full paragraph on Page 3, Lines 7-17, with the following amended paragraph:

One aspect of this invention provides three-dimensional, unitary, molded, multi-polymeric articles comprising a generally planar two-dimensional base section formed from one polymer material and a plurality of projecting elements extending from one side of the base section, the base, wherein at least some of the terminal parts of the projecting elements are formed from a second polymer material. In a preferred embodiment ~~the base section~~ the base of the article is formed from one polymer material, terminal parts of at least some of the projecting elements are formed from another polymeric material, and the ~~base sections~~ lower portions of projecting elements are formed from a mixture of the two polymeric materials. In many cases the ~~base sections~~ lower portions of the projecting elements will have one polymer material at its surface and another polymeric material at its core.

Please replace the second paragraph on Page 3, Lines 18-30, that extends to Page 4, Lines 1-14 with the following amended paragraph:

The distinct polymeric materials can differ in ~~composition, e.g. comprise~~ composition, e.g., comprise distinct polymers, or comprise the same base polymer with different additives, ~~e.g. dyes~~ additives, e.g., dyes or pigment of different colors or other fillers. Polymers useful in the articles of this invention are preferably thermoplastic ~~polymers, e.g. polyolefins~~ polymers, e.g.,

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polyolefins such as polyethylene and polypropylene, vinyl polymers such as polystyrene, styrene-acrylonitrile copolymers, styrene-butadiene copolymers and acrylonitrile butadiene-styrene graft copolymers and polyvinyl butyral, polyamides such as nylon-6 or nylon-6,6, thermoplastic, urethane polymers, thermoplastic elastomers, and the like including blends and alloys of polymers. The polymers used in the molded articles can comprise a variety of additives, ~~e. g. slip agents~~, e.g., slip agents, stabilizers, UV absorbers and antioxidants. The polymers used in the molded articles can also comprise a variety of dispersed functional fillers, ~~e. g. minerals~~ e.g., minerals such as silica, quartz and alumina, metal oxides such as titanium dioxide, iron oxide, indium tin oxide (ITO), antimony tin oxide (ATO), conductive fillers such as carbon black, carbon fibers, ITO, ATO or conductive polymers such as polyaniline or polypyrrole. Preferred polymeric material for many applications such as door mats is polyethylene with different color pigment additives for the specific polymer used in different parts of the article. For instance, and in one embodiment of the invention, with reference to Figures 1 and 2, preferred door mats can comprise polyethylene in one color pigment for the base section ribs 1 of a mat and the ~~base-section~~ lower portion 2 of the blade-like projecting elements and polyethylene in a distinct color pigment for the terminal parts 3 of blade-like projecting elements. Figure 2 also illustrates another specific embodiment of the multi-color mat according to this invention wherein a portion of the terminal parts 3 of blade-like projecting elements contain the same color pigment as ~~base~~ lower portion 2 and a portion of the terminal parts 3 of blade-like projecting elements contain a different color pigment from ~~base-section~~ lower portion 2.

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Please replace the second full paragraph on Page 4, Lines 21-23, with the following amended paragraph:

In the case of door mats it is generally preferred to laminate a slip-resistant sheet to the ~~base-section-2: base 1.~~ In the case of nest pads is preferred to provide open spaces in the mat to facilitate cleaning.

Please replace the first full paragraph on Page 5, Lines 15-30 that extends to Page 6, Lines 1-17, with the following amended paragraph:

With reference to Figure 5, and in one embodiment of the invention, there is shown a rotatable mold drum 20 with a plurality of rows of cavities 22 and ribbed base-forming grooves 24 in the peripheral surface which is proximate to a matched arcuate surface of a stationary polymer injection block 26. The polymer injection block according to this invention has on its back face 28 a first polymer supply network comprising a first elongated groove 30, a second elongated groove 32 and a plurality of interconnecting grooves 34. Extending from first elongated groove 30 is a plurality of ribbed base-forming channels 36 passing through flow control valve 38 and terminating at port 54 to supply said first polymer to the ribbed base-forming grooves 24 on a rotating mold drum 20. Extending from second elongated groove 32 is a plurality of cavity filling channels 42 passing through flow control valve 44 and terminating at slotted port 46 to supply said first polymer to the ~~base-section~~ lower portion of projecting

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element forming cavity 22. Because cavities 22 are offset from grooves 24, channels 36 and 42 are correspondingly offset. Aligned with channel 42 is a second polymer supply channel 48, which communicates from the back face 28 to second polymer supply port 50, which serves to supply a second polymer to the cavities 22 for forming the terminal portions 58 of the projecting elements. The second polymer is supplied at greater pressure than the first polymer. Another alternative is to eliminate channel 34 and supply polymer to channels 30, 32 and 48 separately. Wiper elements 52 affixed to the stationary polymer injection block 26 and slidingly fitted into grooves 24 serve to contain the higher pressure second polymer in the area of the passing cavity 22. The back face 28 can be covered with a one or more gasketed backing plates (not shown) machined to supply a first polymer at one or more connections to the first polymer supply network and a second polymer at one or more connections to the second polymer channels 48. Valves 38 and 44 can be adjusted to supply the first polymer at different pressures to the ribbed base-forming ports 54 and the ports 46 which can be preferably slotted or not - simply an open bore. Accounting for system pressure drop in channels it is possible to design a first polymer supply network with only one or no valves. However, for maximum flexibility in choice of polymers, operating conditions and molded product design it is preferred to provide the stationary polymer injection block with both valves 38 and 44 on each of the corresponding channels 36 and 42, respectively.

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Please replace the second full paragraph on Page 6, Lines 23-30, that extends to Page 7, Lines 1-13, with the following amended paragraph:

In the method for forming three-dimensional, multi-polymer articles, a first polymer is first supplied from a first set of two sets of circumferentially aligned, cavity injection ports to a cavity area in a mold drum 20 (shown in Figure 5) rotating in arcuate proximity with the first set of ports to form in the cavities ~~base-section proximate~~ lower portion proximate parts 2 of projecting elements. A different polymer is then supplied from a second set of said two sets of circumferentially aligned, cavity injection ports to said cavity area rotating past said first sets if port into proximity with said second set of ports to form in said cavities terminal parts of said projecting elements. The first polymer is supplied at a relatively low pressure so as to fill only the part of the cavity proximate solidifying at the mold wall and remaining generally molten in the core. The second polymer is supplied at a relatively high pressure to flow through the generally molten core to the terminal parts of the cavity. Some of the molten first polymer that is advanced toward the terminal end and the final projecting elements generally have a different polymer core with a first polymer surface at the ~~base-section~~ lower portion 2 and a second polymer surface at the terminal ends 3. Accordingly, the cross-section of the ~~base-section~~ lower portion 2 is large enough to provide an essentially solid mold wall and a generally molten polymer core. One skilled in the art may determine the dimensions of the cross-section of the ~~base-section~~ lower portion 2 without undue experimentation depending on the specific polymers

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used. For example, the molten core may comprise one half of the total cross-section of the base section lower portion 2.

Please replace the first full paragraph on Page 8, Lines 1-21, with the following amended paragraph:

In the case of decorative multi-color door mats any of a wide variety of color schemes can be selected depending on aesthetic taste, ~~e. g. white tipped blades~~ e.g., white tipped blades on a black base, yellow tipped blades on a green base, tan tipped blades on a brown base, or even ivory tipped blades on a taupe base. Further enhancements in design can be achieved by varying the length of the plugs in the cavities in geometric patterns. For instance sculptured borders can be achieved by plugging cavities in a pattern. In other embodiments, backing plates can be drilled to supply the first polymer to selected channels D to provide certain projecting elements entirely in the same color pigment as the base. In still other cases, variation in colors or pigments among a group of buds or within a single bud of projecting elements can be achieved by plug design, ~~e. g. vents for blade-like~~ e.g., vents for blade-like elements can be of variable size so that low pressure injection of a first polymer can fully fill the blade mold for elements with larger diameter vents and only a higher pressure second polymer can fully fill the blade mold for elements with smaller diameter vents. Elements with intermediate vents may have more or less of the two polymers. Alternatively, plugs can be solid and located close to the surface to provide essentially no projections merely a base section for mat integrity, a concept which is useful in

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sculptured mats. Mold design can permit production of a multi-color mat with at least a minority of said blade-like projecting elements of a different color pigment from the ~~base~~; lower portion 2; or, alternatively, with at least a majority of such elements of a different color pigment from the ~~base-section 2~~. lower portion 2.